

WHAT IS CLAIMED IS:**1. A vehicular motion control apparatus comprising:**

5 a steering operator that is operated by a driver;
 a steering angle sensor that detect a steering angle as an absolute
rotational angle of the steering operator;
 a detector that detects an actual vehicle state quantity; and
 a controller that calculates a plurality of target vehicle state quantities on
the basis of a plurality of steering angles estimated from the steering angle detected by
10 the steering angle sensor if a reference rotational position of the steering angle sensor
has not been determined, and that controls motion of a vehicle on the basis of the
minimum one of differences between the actual vehicle state quantity and the target
vehicle state quantities.

15 **2. The control apparatus according to claim 1, wherein**

the vehicle state quantity is estimated on the basis of a steering angle.

3. The control apparatus according to claim 2, wherein

20 the vehicle state quantity is a yaw rate of the vehicle, a lateral
acceleration of the vehicle, or a wheel speed difference between left and right wheels to
be steered.

4. The control apparatus according to claim 1, wherein

25 the number of the target vehicle state quantities that are calculated is
equal to the number of turns of the reference rotational position of the steering angle
sensor by 360° within a rotatable angle range of the steering operator.

5. A vehicular motion control apparatus comprising:

a steering operator that is operated by a driver;
a steering angle sensor that detects a steering angle as an absolute rotational angle of the steering operator;
5 a detector that detects an actual vehicle state quantity; and
a controller that calculates a plurality of target vehicle state quantities on the basis of a plurality of steering angles estimated from the steering angle detected by the steering angle sensor, that determines a reference rotational position of the steering angle sensor on the basis of a steering angle corresponding to the minimum one of
10 differences between the actual vehicle state quantity and the target vehicle state quantities, and that then calculates a steering angle for controlling motion of a vehicle on the basis of the steering angle detected by the steering angle sensor and the determined reference rotational position.

15 6. The control apparatus according to claim 5, wherein

the controller calculates time averages of differences between the actual vehicle state quantity and the target vehicle state quantities, and determines the reference rotational position of the steering angle sensor on the basis of a steering angle corresponding to the minimum one of the time averages.

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7. The control apparatus according to claim 6, wherein

the controller determines the reference rotational position of the steering angle sensor on the basis of the steering angle corresponding to the minimum one of the time averages if the minimum one of the time averages is equal to or smaller than a
25 reference value.

8. The control apparatus according to claim 7, wherein

the controller determines the reference rotational position of the steering angle sensor on the basis of a steering angle corresponding to the minimum one of the time averages if the minimum one of the time averages is equal to or smaller than a reference value while a difference between the maximum one of the time averages and the medium one of the time average is larger than a predetermined value and a difference between the medium one of the time average and the minimum one of the time average is larger than the predetermined value.

9. The control apparatus according to claim 5, wherein

the controller calculates time averages of differences between the actual vehicle state quantity and the target vehicle state quantities, calculates steering angle deviation amounts on the basis of the time averages of the differences according to an equation shown below, and determines the reference rotational position of the steering angle sensor on the basis of a steering angle corresponding to the minimum one of the steering angle deviation amounts, and

the equation is:

steering angle deviation amount = time average of difference $\times (NH/V)$

where N, H, and V represent a ratio of a turning angle of the wheels to a total operation amount of the steering operator, a distance between the front wheels and the rear wheels, and a vehicle speed, respectively.

10. The control apparatus according to claim 5, wherein

the vehicle state quantity is estimated on the basis of a steering angle.

11. The control apparatus according to claim 10, wherein

the vehicle state quantity is a yaw rate of the vehicle, a lateral acceleration of the vehicle, or a wheel speed difference between left and right wheels to be steered.

5 12. The control apparatus according to claim 5, wherein

the number of the target vehicle state quantities that are calculated is equal to the number of turns of the reference rotational position of the steering angle sensor by 360° within a rotatable angle range of the steering operator.

10 13. The control apparatus according to claim 5, wherein

the controller calculates a target control amount using the steering angle for controlling motion of the vehicle, and controls motion of the vehicle on the basis of the target control amount.

15 14. A vehicular motion control method comprising the steps of:

detecting a steering angle as an absolute rotational angle of a steering operator operated by a driver;

detecting an actual vehicle state quantity;

calculating a plurality of target vehicle state quantities on the basis of a plurality of steering angles estimated from the detected steering angle if a reference rotational position of the steering angle sensor has not been determined; and

controlling motion of the vehicle on the basis of the minimum one of differences between the target vehicle state quantities and the actual vehicle state quantity.

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15. A vehicular motion control method comprising the steps of:

- detecting a steering angle as an absolute rotational angle of a steering operator operated by a driver by means of a steering angle sensor;
- detecting an actual vehicle state quantity;
- calculating a plurality of target vehicle state quantities on the basis of a plurality of steering angles estimated from the detected steering angle;
- 5 determining a reference rotational position of the steering angle sensor on the basis of a steering angle corresponding to the minimum one of differences between the actual vehicle state quantity and the target vehicle state quantities; and
- calculating a steering angle for controlling motion of the vehicle on the basis of the detected steering angle and the determined reference rotational position.
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16. The control method according to claim 15, further comprising the step of:

- calculating time averages of differences between the actual vehicle state quantity and the target vehicle state quantities,
- 15 wherein
- the reference rotational position of the steering angle sensor is determined on the basis of the steering angle corresponding to the minimum one of the time averages.